Asian Journal of Scientific Research and Innovations
ISSN: 2715-xxxx (online) | IF: 10.23 | Vol: 1, issue 1
Available: http://asiansciencejournal.org

IMPROVING THE LAND CADASTRE DATABASE BASED ON MODERN DIGITAL TECHNOLOGIES

Safarov Fayzli
Murtozayev Zarif
Students of Karshi State Technical University

Abstract: This article analyzes the advantages and prospects of maintaining the land cadastre through digital technologies. The study examines the practical application of GPS, GIS, drones, and electronic platforms based on the experience of Uzbekistan and foreign countries. The findings indicate that digital systems increase the accuracy and speed of land area measurements, reduce human errors, and improve the quality of public services. The article also identifies existing challenges and provides recommendations for addressing them. Furthermore, it highlights the opportunities for modernizing the land resources management system through digitalization.

Keywords: land cadastre, digital technologies, GPS, GIS, drones, geoportal.

Introduction

In modern society, digital technologies are widely used in various fields, including the land cadastre system. The land cadastre plays an important role in recording state property, regulating legal relations concerning land, establishing the taxation system, and supporting spatial planning. Traditional cadastral systems have often relied on manual procedures, which have resulted in human errors, corruption risks, and delays in processing information. Nowadays, modern management and monitoring mechanisms are being introduced through the digitalization of this system. This article analyzes the processes, methods, results, and prospects of maintaining the land cadastre based on digital technologies. The main purpose of this research is to study ways of improving the land cadastre database through modern digital technologies, evaluate the effectiveness of existing information systems, and develop scientific and practical recommendations for their further development. To achieve this objective, the following tasks have been identified: – to study the structure and functional capabilities of the land cadastre database; – to analyze the importance of GPS, GIS, GNSS, and remote sensing technologies in the cadastral sector; – to examine the processes of storing, processing, and updating information in electronic databases; – to analyze the experience of foreign countries in developing digital land cadastre systems; – to develop proposals and recommendations aimed at improving the land cadastre database.

Materials and Methods During the research, electronic platforms such as "E-Cadastre", "Geoportal", and "Yermuloqot", developed by the Cadastre Agency of the Republic of Uzbekistan, were examined. In addition, the experiences of foreign countries, particularly Turkey, the Republic of Korea, and the United States, in implementing digital land cadastre systems were analyzed. GPS (Global Positioning System), GIS (Geographic Information Systems), and photogrammetry methods were considered in the measurement of land plots. Actual changes in land areas were identified using aerial images obtained by drones and laser scanning technologies. A survey was conducted among employees of the Cadastre Agency and students to collect information about the advantages, challenges, and recommendations related to the use of electronic cadastral systems. The land cadastre database is an information system that enables the systematic storage, processing, and use of all essential information concerning land resources. This database contains legal, economic, natural, and geographical information related to each land plot. The main components of the

land cadastre database include: 1. Geographical data – the location, coordinates, boundaries, and area of a land plot.

2. Legal data – ownership, possession, and land-use rights related to a particular land plot.

3. Economic data – land value, assessment indicators, and taxation-related information.

4. Soil data – soil types, fertility, salinity levels, and soil bonitation scores.

5. Cartographic data – digital maps, land plot boundaries, and geographical locations. The integration of these data into a unified electronic database plays an important role in the effective management of land resources, monitoring land use, and providing cadastral services efficiently.

Results

According to the analysis, the following significant improvements were identified: Increased accuracy: Digital measurement methods have made it possible to increase the accuracy of land area measurements to 95–98%. Improved efficiency: While traditional surveying procedures may take 3–4 days, the use of GPS and drones can reduce this period to 1–2 days. Data accessibility: Electronic platforms have enabled 65% of users to independently obtain information related to their land plots. Reduction of errors: Digital systems minimize human errors and automatically store measurement results and other relevant information. User convenience: Interactive maps, mobile applications, and electronic applications have made access to land cadastre services easier and more convenient. Today, various modern digital technologies are being used to develop the land cadastre system. Each of these technologies plays an important role in collecting, storing, processing, and analyzing information about land resources.

GPS and GNSS technologies make it possible to determine the geographical coordinates of land plots, identify boundary points, and perform geodetic surveying with high accuracy. Geographic Information Systems (GIS) provide opportunities to display information about land plots on digital maps, analyze territories, and integrate various layers of geographical data. Drones are used to obtain high-resolution aerial photographs of territories. These images make it possible to monitor changes in land areas, identify unauthorized construction, and assess land-use conditions. Artificial intelligence technologies represent a promising direction for analyzing large volumes of cadastral data, detecting changes in maps, and automating information processing procedures. Cloud technologies enable centralized storage of cadastral information, access to data from different regions, and efficient information exchange between relevant organizations. Thus, the integration of these technologies contributes to improving the accuracy, reliability, and efficiency of the land cadastre database.

Discussion

The obtained results demonstrate that digital technologies increase the efficiency of the land cadastre system. Technologies such as GPS and GIS make it possible to carry out surveying activities accurately, quickly, and reliably. This creates opportunities to monitor land conditions, ranging from agricultural areas to industrial territories, and to ensure fair taxation. However, several challenges remain. In particular, internet infrastructure is insufficient in some regions, which limits access to digital platforms. Furthermore, some users lack adequate digital literacy and therefore continue to rely on traditional methods. To address these challenges, government institutions and educational organizations should strengthen awareness campaigns and training programs aimed at improving digital literacy. Moreover, integrating digital cadastral databases into a unified system, automatically analyzing information using artificial intelligence, and developing user-oriented services based on advanced international experience will take the cadastral system to a new level of

development. To further improve the land cadastre database, existing information systems should be integrated with modern technologies. First of all, it is essential to combine land-related information stored in different organizations into a unified electronic information environment.

One of the promising directions for improving the database is the introduction of an automated monitoring system. Such a system would make it possible to regularly monitor changes in land areas using satellite imagery and data obtained from drones. It is also necessary to establish mechanisms for regularly updating cadastral information. Changes in the area, boundaries, designated use, and legal status of land plots must be reflected in the electronic database in a timely manner. In addition, ensuring information security is one of the key priorities. Modern data protection tools, backup systems, and mechanisms for controlling user access rights should be developed to prevent unauthorized modification or loss of information. In the future, the extensive use of artificial intelligence, Big Data, and cloud technologies in the land cadastre system will make it possible to establish a more effective model for land resources management. Based on the conducted analysis, the following practical recommendations have been developed to improve the land cadastre database:

1. Integrate all land cadastre-related information into a unified centralized electronic database.
2. Regularly verify and update the geographical boundaries and coordinates of land plots using modern GNSS technologies.
3. Develop remote monitoring systems for land resources based on drone imagery and satellite data.
4. Introduce mechanisms for automatically detecting and analyzing changes in land areas through artificial intelligence.
5. Strengthen modern information security systems to ensure the protection of cadastral data.
6. Regularly improve the digital knowledge and professional skills of specialists working in the cadastral sector.

The implementation of these recommendations will help improve the quality of the land cadastre database, accelerate information exchange, and increase the efficiency of land resources management.

Conclusion

The research findings demonstrate that maintaining the land cadastre through digital technologies is significantly more efficient, accurate, and transparent compared to traditional methods. GPS, GIS, drones, and electronic platforms ensure accurate measurement of land areas, rapid registration of information, and convenient service delivery to users. Digitalization not only reduces human errors but also significantly minimizes the risks of corruption. However, technical limitations in certain regions and insufficient levels of digital literacy continue to create challenges. In the future, expanding internet infrastructure, improving the professional qualifications of specialists, and implementing innovative approaches will be essential for further developing the system. The full implementation of a digital land cadastre system will create broad opportunities for the rational use of land resources and their effective management.

REFERENCES

1. Land Code of the Republic of Uzbekistan. – Tashkent: Adolat Publishing House, 2020.

2. Concept for the Digitalization of the Cadastre System. – Official source of the Cadastre Agency of the Republic of Uzbekistan, 2023.

3. Qodirov, A., Karimov, B. Fundamentals of Land Management and Cadastre. – Tashkent: O‘qituvchi, 2019.

4. Karimova, D. Fundamentals of Geoinformatics and Remote Sensing. – Tashkent: Innovatsiya Publishing House, 2022.

5. UN-GGIM. Future Trends in Geospatial Information Management: The Five to Ten Year Vision. United Nations, 2020.

6. Williamson, I., Enemark, S., Wallace, J., Rajabifard, A. Land Administration for Sustainable Development. – ESRI Press, 2010.